WE CLAIM:

1. A method of managing a fluid and/or gas reservoir which assimilates diverse data having different acquisition time scales and spatial scales of coverage for iteratively producing a reservoir development plan that is used for optimizing an overall performance of said reservoir, comprising the steps of:

(a) generating an initial reservoir characterization,

(b) from the initial reservoir characterization, generating an initial reservoir development plan,

(c) when the reservoir development plan is generated, incrementally advancing and generating a capital spending program,

(d) when the capital spending program is generated, monitoring a performance of the reservoir by acquiring high rate monitor data from a first set of data measurements taken in the reservoir,

(e) further monitoring the performance of the reservoir by acquiring low rate monitor data from a second set of data measurements taken in the reservoir,

(f) assimilating together said high rate monitor data and said low rate monitor data,

(g) from said high rate monitor data and said low rate monitor data, determining when it is necessary to update said initial reservoir development plan to produce a newly updated reservoir development plan,

(h) when necessary, updating the initial reservoir development plan to produce the newly updated reservoir development plan, and

(i) when the newly updated reservoir development plan is produced, repeating steps (c) through (h) until it is no longer necessary to update the reservoir development plan, said reservoir being nearly depleted when the reservoir development plan is not updated during step (h).

2. The method of managing a fluid and/or gas reservoir of claim 1, wherein the monitoring step (d) for monitoring a performance of the reservoir by acquiring high rate monitor data comprises the steps of:

(d1) acquiring and accumulating and quality checking the high rate monitor data,

(d2) using said high rate monitor data to evaluate a single well or a region of several wells and returning to step (c), and

(d3) using said high rate monitor data to evaluate a global field or reservoir, performing step (e) when the reservoir development plan should be updated or when new low rate reservoir monitor data should be acquired, and returning to step (c) when the reservoir development plan should not be updated or when new low rate reservoir monitor data should not be acquired.

3. The method of managing a fluid and/or gas reservoir of claim 2, wherein the monitoring step (e) for monitoring the performance of the reservoir by acquiring low rate monitor data comprises the steps of:

(e1) determining when new low rate reservoir monitor data should be acquired via new measurements by performing a sensitivity analysis survey predesign study to determine if the new measurements are expected to introduce new information,

(e2) acquiring the new low rate reservoir monitor data when it is determined that the new low rate reservoir monitor data should be acquired and the new measurements will introduce new information,

(e3) updating a reservoir model when new low rate reservoir monitor data should not be acquired via new measurements, and

(e4) updating a production forecast and an economic analysis when the reservoir model is updated or when the low rate reservoir monitor data is acquired during step (e2).

4. The method of managing a fluid and/or gas reservoir of claim 1, wherein the generating step (a) for generating an initial reservoir characterization comprises the step of:

performing a preliminary engineering step in parallel with a geological modeling step in order to reconcile a set of geoscience interpretations made using static data during a geological modeling step with a set of engineering interpretations made using dynamic or performance related data during a preliminary engineering step.

5. The method of managing a fluid and/or gas reservoir of claim 4, wherein the generating step (a) for generating an initial reservoir characterization further comprises the steps of:

(a1) determining for a particular reservoir field a set of development and depletion strategies,

(a2) determining a set of integrated study objectives ,

(a3) performing data acquisition, quality control, and analysis,

(a4) performing preliminary engineering, and

(a5) performing geological modeling in parallel with the preliminary engineering.

6. The method of managing a fluid and/or gas reservoir of claim 5, further comprising:

(x) determining if either a rigorous scientific approach associated with a numerical forecasting model should be used to build a numerical simulator for generating a production forecast or if various standard analytical methods which are not associated with the numerical forecasting model should be used to generate the production forecast,

a numerical model studies step being performed when the rigorous scientific approach associated with the numerical forecasting model is used,

an analytical model studies step being performed when the various standard analytical methods are used.

7. The method of managing a fluid and/or gas reservoir of claim 6, wherein the generating step (b) for generating an initial reservoir development plan from the initial reservoir characterization comprises the steps of:

(b1) in response to the determining step (x) for determining if said rigorous scientific approach or said various standard analytical methods should be used to generate said production forecast, performing either said numerical model studies step or said analytical model studies step,

(b2) generating a production and reserves forecast in response to the numerical model studies step or the analytical model studies step,

(b3) generating facilities requirements from the production and reserves forecast,

(b4) considering environmental issues in response to the development and depletion strategies determined during step (a1),

(b5) performing an economics and risk analysis study while taking into account the environmental considerations, the production and reserves forecast, and the facilities requirements, and

(b6) producing an optimized development plan in response to and in view of the economics and risk analysis.

8. The method of managing a fluid and/or gas reservoir of claim 5, wherein the performing step (a3) for performing data acquisition, quality control, and analysis comprises the steps of:

(a3.1) gathering together a first set of data relating to a particular reservoir field under study in a study plan and then gathering a set of supplemental data from alternative sources to supplement said first set of data if said first set of data is not sufficient to produce a database of data which includes a plurality of data,

(a3.2) verifying that the plurality of data in the database are consistent with each other thereby producing a verified database having a plurality of data, and

(a3.3) verifying said study plan to verify that said plurality of data in the verified database is sufficient as to amount or quality or quantity, and, if said plurality of data is not sufficient, adjusting a scope of said study plan.

9. The method of managing a fluid and/or gas reservoir of claim 8, wherein the performing step (a4) for performing preliminary engineering comprises the steps of:

(a4.1) knowing a 'set of fluid properties' in a reservoir fluid properties model, comparing reservoir pressures in a set of reservoir pressure survey data when the 'set of fluid properties' is known, and adjusting the reservoir pressures to a common datum thereby producing a corrected 'reservoir pressure history' which reflects the history of the reservoir pressure corrected to a common datum,

(a4.2) generating a corrected well 'production and injection history' in response to the set of fluid properties and a reported field production,

(a4.3) conducting production and pressure test interpretations adapted for conducting a well test of one or more wells, measuring a plurality of pressure and rate versus time test data from the one or more wells, and interpreting the test data when the set of fluid properties is known,

(a4.4) determining a set of well drilling and completion histories which examines where a set of wells are drilled and how the wells are drilled and completed,

(a4.5) determining a set of production enhancement opportunities in response to the well test of step (a4.3) and the drilling and completion histories of step (a4.4) to identify what immediate opportunities exist to stimulate a well or install a pump that will result in higher production rates, and

(a4.6) performing material balance volume and acquifer interpretations for estimating and determining, after extraction and injection of fluids into a formation, what were the original volumes of the fluids in place in the formation.

10. The method of managing a fluid and/or gas reservoir of claim 9, wherein the performing step (a4) for performing preliminary engineering further comprises the steps of:

(a4.7) determining an incremental rate and recovery potential for estimating incremental oil rates and potential oil recoveries associated with the production enhancement opportunities,

(a4.8) determining completion workover and infill guidelines adapted for monitoring the impact of a completion workover or infill workplan, generating additional production data, determining if the production enhancement opportunities are correct, and redesigning the completion workover of said completion workover and infill guidelines in response thereto,

(a4.9) determining, in a relative permeability and capillary pressure saturation model, the flow characteristics of oil and gas and water when all exist simultaneously in a reservoir,

(a4.10) investigating, in a single well or reservoir 'sector model', specific reservoir mechanisms and the impact the mechanisms have on a full field model design,

(a4.11) using, in connection with reservoir mechanism sensitivity, alternative grid descriptions with one of the 'sector models' and determining which 'particular alternative grid description' better represents a mechanism which exists in the reservoir field, and

(a4.12) with respect to a reservoir model design criteria, determining what must be done to properly design a reservoir model and producing a set of 'reservoir model design criteria' in response to the 'reservoir fluid properties' and the 'production injection history' and the 'reservoir pressure history' and the 'particular alternative grid description'.

11. The method of managing a fluid and/or gas reservoir of claim 8, wherein the performing step (a5) for performing geological modeling comprises the steps of:

(a5.1) determining a preliminary petrophysical model representing a method for converting well logs into a calculated reservoir property profile at each well location,

(a5.2) determining a final petrophysical model from the preliminary petrophysical model and said preliminary engineering, said final petrophysical model representing information relating to a set of more detailed reservoir properties within said structural framework,

(a5.3) determining a regional geologic model representing a regional geology in an earth formation associated with a particular reservoir field and applying a framework of sedimentology and stratigraphy to said formation during a sedimentologic and stratigraphic analyses,

(a5.4) in response to the sedimentologic and stratigraphic analyses, performing detailed stratigraphic correlations between wells and establishing continuity of geologic horizons across the reservoir field, and

(a5.5) performing a geomechanical analysis which in association with a set of geomechanical properties of the reservoir enables the conversion of time measured data from seismic into depth measurements and provides an indication of reservoir stresses which can be computed from the geomechanical properties.

12. The method of managing a fluid and/or gas reservoir of claim 11, wherein the performing step (a5) for performing geological modeling further comprises the steps of:

(a5.6) defining a structural framework of the reservoir in response to the geomechanical analysis and the detailed stratigraphic correlations, the structural framework of the reservoir describing an overall shape of the reservoir,

(a5.7) defining a set of well and interval property summaries in response to said final petrophysical model and a seismic attribute analysis, the well and interval property summaries providing seismic information enabling one to relate a seismic response to a set of measured properties from well logs,

(a5.8) defining a reservoir structure and property model in response to the well and interval property summaries and the seismic attribute analysis and the structural framework,

(a5.9) performing reservoir volume calculations which provide an estimate of fluids in place in the reservoir in response to the reservoir structure and property model,

(a5.10) comparing, in a volumes consistent decision, the reservoir volume calculations with a material balance from preliminary engineering, and, if the comparing step reveals the volumes are consistent, a geoscience interpretation of the reservoir agrees with an interpretation of the reservoir from a performance standpoint, and, if the comparing step reveals the volumes are not consistent, either adjusting said geoscience interpretation or identifying unresolved uncertainties.

13. The method of managing a fluid and/or gas reservoir of claim 7 wherein the performing step (b1) for performing a numerical model studies step comprises the steps of:

(b1.1) defining a property distribution in a 3D structure and property model,

(b1.2) defining a grid system in a 3D simulator grid system,

(b1.3) defining a fluid property and saturation model,

(b1.4) defining preliminary estimates of the extent or size of an aquifer in an initial reservoir conditions and aquifer model,

(b1.5) combining the property distribution and the grid system and the fluid property and saturation model and the preliminary estimates of the extent or size of the aquifer in a 3D reservoir simulator for defining a rock model in the reservoir simulator and superimposing a saturation distribution in the rock model and creating an initial reservoir model in the reservoir simulator,

(b1.6) performing a volumes consistent check to determine whether there is consistency in initial volumes and whether the grid system that is superimposed on the rock model is a reliable representation of a property description developed during the geological modeling step (a5), and

(b1.7) when there is consistency in the initial volumes, generating a corrected volume model.

14. The method of managing a fluid and/or gas reservoir of claim 13 wherein the performing step (b1) for performing a numerical model studies step further comprises the steps of:

(b1.8) when there is not consistency, since the grid system fails to reproduce the property description, adjusting, in a model property adjustments step, the grid system until the grid system is a reliable representation of the property description,

(b1.9) defining historical production and injection rate constraints,

(b1.10) combining the corrected volume model with the historical production and injection rate constraints for running, in a model response to historic rate constraints step, the model through a historic period, obtaining a set of model responses, and comparing the model responses to actual measured performance,

(b1.11) comparing, in a model reproduces history step, the model performance to the historical data to determine if the model performance reproduces the historical data,

(b1.12) if the model performance did not reproduce the historical data, making adjustments, in a model property adjustments step, to the model properties,

(b1.13) storing and identifying the adjustments to the model properties as uncertainties in sensitivity and risk analysis, and

(b1.14) if the model performance did reproduce the historical data after having performed the making adjustments step and since a history calibrated model is created, generating a first output signal for use by a production and reserves forecast, said first output signal including the history calibrated model and the uncertainties.

15. The method of managing a fluid and/or gas reservoir of claim 7 wherein the performing step (b1) for performing an analytical model studies step comprises:

(b1.1) providing input data to the analytical model study, said input data including analogous reservoir performance, well drilling and completion histories, historic well performance trends, reservoir property and structure maps, and material balance volumes and aquifer model,

(b1.2) from plots of production trends in the historic well performance trends, establishing a set of decline characteristics or a set of productivity characteristics of the reservoir field thereby generating well production decline characteristics which forecasts future performance trends from existing wells,

(b1.3) from the historic well performance trends, mapping, in map displays of well performance indicators, several performance indicators including the total volumes of fluids at different well sites in order to examine which areas of a reservoir field are better or worse than average or better or worse than their companions wells at the different well sites,

(b1.4) comparing, in a conformance decision, the map of the performance indicators including total volumes of fluids at the different well sites with a geologic interpretation set forth in the reservoir property and structure maps and determining if any disagreement exists between said map and said geologic interpretation,

(b1.5) if the disagreement does not exist and there is no total conformance, identifying any potential infill well opportunities reflecting any opportunities to drill any infill wells,

(b1.6) if the disagreement does exist and there is total conformance, determining, in a volumetric and material balance fluids in place estimates step, how the well performance trends balance out with estimates of fluids in place and pressure support from material balance calculations, and

(b1.7) in response to the well production decline characteristics generated during the establishing step (b1.2), identifying workover and artificial lift candidates.

16. The method of managing a fluid and/or gas reservoir of claim 15 wherein the performing step (b1) for performing an analytical model studies step further comprises:

(b1.8) in response to the well production decline characteristics, identifying from actual well performance, in a statistical analysis of well indicators, an average expected performance,

(b1.9) comparing individual wells to said average expected performance to determine where in the reservoir field there exists superior performing wells and where in said field there exists poorer performing wells, and, responsive thereto, selecting via said potential infill well opportunities step opportunities to either enhance existing wellbores or to drill new wellbores,

(b1.10) in response to the well production decline characteristics and having established the decline characteristics for existing wells, forecasting for that group of existing wells, in current well forecasts of production and reserves, future performance trends of the reservoir field if no action is taken,

(b1.11) in response to the well production decline characteristics and the workover and artificial lift candidates, generating incremental production forecasts,

(b1.12) in response to the well production decline characteristics and the potential infill well opportunities, generating infill forecasts of production and reserves representing a forecast of what an extra well in a particular location might generate,

(b1.13) determining if conformance exists between the incremental production forecasts, the current well forecasts of production and reserves, the infill forecasts of production and reserves, and the volumetric and material balance fluids in place estimates,

(b1.14) if conformance does exist, generating a second output signal for use by a production and reserves forecast, the second output signal including current well forecasts of production and reserves, enhanced well production forecasts, and infill forecasts of production and reserves, and

(b1.15) if conformance does not exist, identifying uncertainties and then generating said second output signal.

17. The method of managing a fluid and/or gas reservoir of claim 14, wherein the generating step (b2) for generating a production and reserves forecast in response to the numerical model studies step comprises the steps of:

(b2.1) in response to a plurality of constraints and to the first output signal from the numerical model studies step which includes the history calibrated model, running a model in a simulator and generating a production forecast representing the way a reservoir responds to a development plan, said development plan defining a mechanism representing a process that is active in the reservoir field,

(b2.2) determining whether an implementation plan of the mechanism or whether the constraints can be changed or optimized,

(b2.3) if the implementation plan or the constraints can be changed or optimized, changing the implementation plan of the mechanism or the constraints, re-running the model in the simulator, and generating another production forecast,

(b2.4) if the implementation plan or the constraints cannot be changed or optimized, determining if the mechanism representing the process that is active in the reservoir field can be changed, and

(b2.5) if the mechanism can be changed which represents a new development plan or new mechanism, revising an implementation plan of the new mechanism to create a new implementation plan and re-running the model in the simulator thereby generating still another production forecast.

18. The method of managing a fluid and/or gas reservoir of claim 17, wherein the generating step (b2) for generating a production and reserves forecast in response to the numerical model studies step further comprises the steps of:

(b2.6) if the new implementation plan or the constraints cannot be changed or optimized and if the new mechanism cannot be changed, determine if there is any need for parametric sensitivity runs,

(b2.7) if there is a need for parametric sensitivity runs, identify a set of uncertainties, alter a reservoir description in the history calibrated model, and repeat steps (b2.1) to (b2.5),

(b2.8) if there is no need for any parametric sensitivity runs, generating a third output signal which includes reservoir fluids production rates and pressures and total fluids injection rates and pressures for the facilities requirements step (b3) and a reservoir development plan for the economics and risk analysis step (b5), the facilities requirements step (b3) responding to that third output signal;

(b2.9) in response to the plurality of constraints and the second output signal from the analytical model studies step which includes the current well forecasts of production and reserves, the enhanced well production forecasts, and the infill forecasts of production and reserves, performing, in the analytical production and reserves forecast, analytical modeling and, responsive thereto, generating an analytical forecast for a particular mechanism and a particular set of development constraints, and

(b2.10) repeating steps (b2.2) through b(2.8) until there is no need for any parametric sensitivity runs and generating a fourth output signal which includes reservoir fluids production rates and pressures and total fluids injection rates and pressures for the facilities requirements step (b3) and a reservoir development plan for the economics and risk analysis step (b5), the facilities requirements step (b3) responding to that fourth output signal.

19. The method of managing a fluid and/or gas reservoir of claim 16, wherein the generating step (b2) for generating a production and reserves forecast in response to the analytical model studies step comprises the steps of:

(b2.1) in response to a plurality of constraints and to the first output signal from the numerical model studies step which includes the history calibrated model, running a model in a simulator and generating a production forecast representing the way a reservoir responds to a development plan, said development plan defining a mechanism representing a process that is active in the reservoir field,

(b2.2) determining whether an implementation plan of the mechanism or whether the constraints can be changed or optimized,

(b2.3) if the implementation plan or the constraints can be changed or optimized, changing the implementation plan of the mechanism or the constraints, re-running the model in the simulator, and generating another production forecast,

(b2.4) if the implementation plan or the constraints cannot be changed or optimized, determining if the mechanism representing the process that is active in the reservoir field can be changed, and

(b2.5) if the mechanism can be changed which represents a new development plan or new mechanism, revising an implementation plan of the new mechanism to create a new implementation plan and re-running the model in the simulator thereby generating still another production forecast.

20. The method of managing a fluid and/or gas reservoir of claim 19, wherein the generating step (b2) for generating a production and reserves forecast in response to the analytical model studies step further comprises the steps of:

(b2.6) if the new implementation plan or the constraints cannot be changed or optimized and if the new mechanism cannot be changed, determine if there is any need for parametric sensitivity runs,

(b2.7) if there is a need for parametric sensitivity runs, identify a set of uncertainties, alter a reservoir description in the history calibrated model, and repeat steps (b2.1) to (b2.5),

(b2.8) if there is no need for any parametric sensitivity runs, generating a third output signal which includes reservoir fluids production rates and pressures and total fluids injection rates and pressures for the facilities requirements step (b3) and a reservoir development plan for the economics and risk analysis step (b5), the facilities requirements step (b3) responding to that third output signal;

(b2.9) in response to the plurality of constraints and the second output signal from the analytical model studies step which includes the current well forecasts of production and reserves, the enhanced well production forecasts, and the infill forecasts of production and reserves, performing, in the analytical production and reserves forecast, analytical modeling and, responsive thereto, generating an analytical forecast for a particular mechanism and a particular set of development constraints, and

(b2.10) repeating steps (b2.2) through b(2.8) until there is no need for any parametric sensitivity runs and generating a fourth output signal which includes reservoir fluids production rates and pressures and total fluids injection rates and pressures for the facilities requirements step (b3) and a reservoir development plan for the economics and risk analysis step (b5), the facilities requirements step (b3) responding to that fourth output signal.

21. The method of managing a fluid and/or gas reservoir of claim 18, wherein the generating step (b3) for generating facilities requirements from the production and reserves forecast comprises the steps of:

(b3.1) in response to that portion of the third and the fourth output signals from the production and reserves forecasts step (b2) which includes the reservoir fluids production rates and pressures, estimating a first set of facilities that are required for the reservoir fluids production rates and pressures,

(b3.2) determining if one or more first set of changes are required to said first set of facilities,

(b3.3) if the one or more first set of changes to the first set of facilities is required, making said first set of changes to said first set of facilities, said one or more first set of changes having associated therewith a capital cost and possible incremental operating cost adapted for use by the economics and risk analysis step (b5),

(b3.4) in response to that portion of the third and the fourth output signals from the production and reserves forecasts step (b2) which includes the total fluids injection rates and pressures, estimating a second set of facilities that are required for the total fluids injection rates and pressures,

(b3.5) determining if one or more second set of changes are required to said second set of facilities, and

(b3.6) if the one or more second set of changes to the second set of facilities is required, making said second set of changes to said second set of facilities, said one or more second set of changes having associated therewith a capital cost and possible incremental operating cost adapted for use by the economics and risk analysis step (b5).

22. The method of managing a fluid and/or gas reservoir of claim 20, wherein the generating step (b3) for generating facilities requirements from the production and reserves forecast comprises the steps of:

(b3.1) in response to that portion of the third and the fourth output signals from the production and reserves forecasts step (b2) which includes the reservoir fluids production rates and pressures, estimating a first set of facilities that are required for the reservoir fluids production rates and pressures,

(b3.2) determining if one or more first set of changes are required to said first set of facilities,

(b3.3) if the one or more first set of changes to the first set of facilities is required, making said first set of changes to said first set of facilities, said one or more first set of changes having associated therewith a capital cost and possible incremental operating cost adapted for use by the economics and risk analysis step (b5),

(b3.4) in response to that portion of the third and the fourth output signals from the production and reserves forecasts step (b2) which includes the total fluids injection rates and pressures, estimating a second set of facilities that are required for the total fluids injection rates and pressures,

(b3.5) determining if one or more second set of changes are required to said second set of facilities, and

(b3.6) if the one or more second set of changes to the second set of facilities is required, making said second set of changes to said second set of facilities, said one or more second set of changes having associated therewith a capital cost and possible incremental operating cost adapted for use by the economics and risk analysis step (b5).

23. The method of managing a fluid and/or gas reservoir of claim 21, wherein the considering step (b4) for considering environmental issues comprises the steps of:

(b4.1) considering special emergency response plans and provisions,

(b4.2) considering pre-construction environmental impact study requirements,

(b4.3) considering interrupted or restricted access to wells and facilities, and

(b4.4) considering government or regulatory approval and audit provisions.

24. The method of managing a fluid and/or gas reservoir of claim 22, wherein the considering step (b4) for considering environmental issues comprises the steps of:

(b4.1) considering special emergency response plans and provisions,

(b4.2) considering pre-construction environmental impact study requirements,

(b4.3) considering interrupted or restricted access to wells and facilities, and

(b4.4) considering government or regulatory approval and audit provisions.

25. The method of managing a fluid and/or gas reservoir of claim 23, wherein the performing step (b5) for performing an economics and risk analysis study comprise the steps of:

(b5.1) in response to the reservoir development plan generated from the production and reserves forecast step (b2), evaluating a set of economics which is associated with said reservoir development plan by generating, responsive to the reservoir development plan, a reservoir production schedule and a reservoir injection schedule and a facility and well schedule,

(b5.2) in response to the facilities requirements step (b3) which includes processing and drilling workover plans, generating a capital cost model and an operating cost model associated therewith,

(b5.3) in response to the environmental considerations step (b4), generating special project costs,

(b5.4) providing, in a plan economic profile, an economic profile and a cash flow summary for the reservoir development plan in response to the reservoir production schedule, the reservoir injection schedule, the facility and well schedule, the capital cost model, the operating cost model, and the special project costs,

(b5.5) determining, in a development and operating risk decision, whether there are significant development and operating risks associated with the reservoir development plan in response to a set of reservoir risk factors,

(b5.6) if there are signficant development and operating risks associated with the reservoir development plan, making adjustments to a set of production forecast schedules and returning to step (b5.4) which provides the plan economic profile and the cash flow summary for the reservoir development plan that produces an estimate of risk associated costs, and

(b5.7) if there are no significant development and operating risks associated with the reservoir development plan, determining if there is a reservoir performance risk relating to a character and a nature of the reservoir that has not been established from history matching and geologic studies.

26. The method of managing a fluid and/or gas reservoir of claim 25, wherein the performing step (b5) for performing an economics and risk analysis study comprise the steps of:

(b5.8) if there is a reservoir performance risk, making adjustments to a set of production forecast schedules and returning to step (b5.4),

(b5.9) if there is no reservoir performance risk, determining if there is an environmental risk,

(b5.10) if there is an environmental risk, making adjustments to a set of production forecast schedules and returning to step (b5.4),

(b5.11) if there is no environmental risk, determining if there are any alternative development plans which should be evaluated from an economic standpoint,

(b5.12) if there are one or more alternative development plans which should be evaluated from an economic standpoint, repeating steps (b5.1) through (b5.11) for each of the one or more alternative development plans and, responsive thereto, generating one or more corresponding economic profiles associated, respectively, with the one or more alternative development plans,

(b5.13) if there are no more additional alternative development plans which should be evaluated, comparing each of the economic profiles associated with each of the alternative development plans and assessing the risks associated with each of the economic profiles, and

(b5.14) selecting a particular development plan from among the one or more alternative development plans evaluated during step (b5.12), the particular development plan selected during the selecting step (b5.14) representing the optimized development plan produced during the producing step (b6).

27. The method of managing a fluid and/or gas reservoir of claim 24, wherein the performing step (b5) for performing an economics and risk analysis study comprise the steps of:

(b5.1) in response to the reservoir development plan generated from the production and reserves forecast step (b2), evaluating a set of economics which is associated with said reservoir development plan by generating, responsive to the reservoir development plan, a reservoir production schedule and a reservoir injection schedule and a facility and well schedule,

(b5.2) in response to the facilities requirements step (b3) which includes processing and drilling workover plans, generating a capital cost model and an operating cost model associated therewith,

(b5.3) in response to the environmental considerations step (b4), generating special project costs,

(b5.4) providing, in a plan economic profile, an economic profile and a cash flow summary for the reservoir development plan in response to the reservoir production schedule, the reservoir injection schedule, the facility and well schedule, the capital cost model, the operating cost model, and the special project costs,

(b5.5) determining, in a development and operating risk decision, whether there are significant development and operating risks associated with the reservoir development plan in response to a set of reservoir risk factors,

(b5.6) if there are signficant development and operating risks associated with the reservoir development plan, making adjustments to a set of production forecast schedules and returning to step (b5.4) which provides the plan economic profile and the cash flow summary for the reservoir development plan that produces an estimate of risk associated costs, and

(b5.7) if there are no significant development and operating risks associated with the reservoir development plan, determining if there is a reservoir performance risk relating to a character and a nature of the reservoir that has not been established from history matching and geologic studies.

28. The method of managing a fluid and/or gas reservoir of claim 27, wherein the performing step (b5) for performing an economics and risk analysis study comprise the steps of:

(b5.8) if there is a reservoir performance risk, making adjustments to a set of production forecast schedules and returning to step (b5.4),

(b5.9) if there is no reservoir performance risk, determining if there is an environmental risk,

(b5.10) if there is an environmental risk, making adjustments to a set of production forecast schedules and returning to step (b5.4),

(b5.11) if there is no environmental risk, determining if there are any alternative development plans which should be evaluated from an economic standpoint,

(b5.12) if there are one or more alternative development plans which should be evaluated from an economic standpoint, repeating steps (b5.1) through (b5.11) for each of the one or more alternative development plans and, responsive thereto, generating one or more corresponding economic profiles associated, respectively, with the one or more alternative development plans,

(b5.13) if there are no more additional alternative development plans which should be evaluated, comparing each of the economic profiles associated with each of the alternative development plans and assessing the risks associated with each of the economic profiles, and

(b5.14) selecting a particular development plan from among the one or more alternative development plans evaluated during step (b5.12), the particular development plan selected during the selecting step (b5.14) representing the optimized development plan produced during the producing step (b6).

29. A method for performing preliminary engineering, comprising the steps of:

(a) knowing a 'set of fluid properties' in a reservoir fluid properties model, comparing reservoir pressures in a set of reservoir pressure survey data when the 'set of fluid properties' is known, and adjusting the reservoir pressures to a common datum thereby producing a corrected 'reservoir pressure history' which reflects the history of the reservoir pressure corrected to a common datum,

(b) generating a corrected well 'production and injection history' in response to the set of fluid properties and a reported field production,

(c) conducting production and pressure test interpretations adapted for conducting a well test of one or more wells, measuring a plurality of pressure and rate versus time test data from the one or more wells, and interpreting the test data when the set of fluid properties is known,

(d) determining a set of well drilling and completion histories which examines where a set of wells are drilled and how the wells are drilled and completed,

(e) determining a set of production enhancement opportunities in response to the well test of step (c) and the drilling and completion histories of step (d) to identify what immediate opportunities exist to stimulate a well or install a pump that will result in higher production rates, and

(f) performing material balance volume and acquifer interpretations for estimating and determining, after extraction and injection of fluids into a formation, what were the original volumes of the fluids in place in the formation.

30. The method for performing preliminary engineering of claim 29, further comprises the steps of:

(g) determining an incremental rate and recovery potential for estimating incremental oil rates and potential oil recoveries associated with the production enhancement opportunities,

(h) determining completion workover and infill guidelines adapted for monitoring the impact of a completion workover or infill workplan, generating additional production data, determining if the production enhancement opportunities are correct, and redesigning the completion workover of said completion workover and infill guidelines in response thereto,

(i) determining, in a relative permeability and capillary pressure saturation model, the flow characteristics of oil and gas and water when all exist simultaneously in a reservoir,

(j) investigating, in a single well or reservoir 'sector model', specific reservoir mechanisms and the impact the mechanisms have on a full field model design,

(k) using, in connection with reservoir mechanism sensitivity, alternative grid descriptions with one of the 'sector models' and determining which 'particular alternative grid description' better represents a mechanism which exists in the reservoir field, and

(l) with respect to a reservoir model design criteria, determining what must be done to properly design a reservoir model and producing a set of 'reservoir model design criteria' in response to the 'reservoir fluid properties' and the 'production injection history' and the 'reservoir pressure history' and the 'particular alternative grid description'.

31. A method for performing geological modeling, comprising the steps of:

(a) determining a preliminary petrophysical model representing a method for converting well logs into a calculated reservoir property profile at each well location,

(b) determining a final petrophysical model from the preliminary petrophysical model and said preliminary engineering, said final petrophysical model representing information relating to a set of more detailed reservoir properties within said structural framework,

(c) determining a regional geologic model representing a regional geology in an earth formation associated with a particular reservoir field and applying a framework of sedimentology and stratigraphy to said formation during a sedimentologic and stratigraphic analyses,

(d) in response to the sedimentologic and stratigraphic analyses, performing detailed stratigraphic correlations between wells and establishing continuity of geologic horizons across the reservoir field, and

(e) performing a geomechanical analysis which in association with a set of geomechanical properties of the reservoir enables the conversion of time measured data from seismic into depth measurements and provides an indication of reservoir stresses which can be computed from the geomechanical properties.

32. The method for performing geological modeling of claim 31, further comprising the steps of:

(f) defining a structural framework of the reservoir in response to the geomechanical analysis and the detailed stratigraphic correlations, the structural framework of the reservoir describing an overall shape of the reservoir,

(g) defining a set of well and interval property summaries in response to said final petrophysical model and a seismic attribute analysis, the well and interval property summaries providing seismic information enabling one to relate a seismic response to a set of measured properties from well logs,

(h) defining a reservoir structure and property model in response to the well and interval property summaries and the seismic attribute analysis and the structural framework,

(i) performing reservoir volume calculations which provide an estimate of fluids in place in the reservoir in response to the reservoir structure and property model, and

(j) comparing, in a volumes consistent decision, the reservoir volume calculations with a material balance from preliminary engineering, and, if the comparing step reveals the volumes are consistent, a geoscience interpretation of the reservoir agrees with an interpretation of the reservoir from a performance standpoint, and, if the comparing step reveals the volumes are not consistent, either adjusting said geoscience interpretation or identifying unresolved uncertainties.

33. A method for performing numerical model studies, comprising the steps of:

(a) defining a property distribution in a 3D structure and property model,

(b) defining a grid system in a 3D simulator grid system,

(c) defining a fluid property and saturation model,

(d) defining preliminary estimates of the extent or size of an aquifer in an initial reservoir conditions and aquifer model,

(e) combining the property distribution and the grid system and the fluid property and saturation model and the preliminary estimates of the extent or size of the aquifer in a 3D reservoir simulator for defining a rock model in the reservoir simulator and superimposing a saturation distribution in the rock model and creating an initial reservoir model in the reservoir simulator,

(f) performing a volumes consistent check to determine whether there is consistency in initial volumes and whether the grid system that is superimposed on the rock model is a reliable representation of a property description developed during the geological modeling step (a5), and

(g) when there is consistency in the initial volumes, generating a corrected volume model.

34. The method for performing numerical model studies of claim 33, further comprising the steps of:

(h) when there is not consistency, since the grid system fails to reproduce the property description, adjusting, in a model property adjustments step, the grid system until the grid system is a reliable representation of the property description,

(i) defining historical production and injection rate constraints,

(j) combining the corrected volume model with the historical production and injection rate constraints for running, in a model response to historic rate constraints step, the model through a historic period, obtaining a set of model responses, and comparing the model responses to actual measured performance,

(k) comparing, in a model reproduces history step, the model performance to the historical data to determine if the model performance reproduces the historical data,

(l) if the model performance did not reproduce the historical data, making adjustments, in a model property adjustments step, to the model properties,

(m) storing and identifying the adjustments to the model properties as uncertainties in sensitivity and risk analysis, and

(n) if the model performance did reproduce the historical data after having performed the making adjustments step and since a history calibrated model is created, generating a first output signal for use by a production and reserves forecast, said first output signal including the history calibrated model and the uncertainties.

35. A method for performing analytical model studies, comprising the steps of:

(a) providing input data to the analytical model study, said input data including analogous reservoir performance, well drilling and completion histories, historic well performance trends, reservoir property and structure maps, and material balance volumes and aquifer model,

(b) from plots of production trends in the historic well performance trends, establishing a set of decline characteristics or a set of productivity characteristics of the reservoir field thereby generating well production decline characteristics which forecasts future performance trends from existing wells,

(c) from the historic well performance trends, mapping, in map displays of well performance indicators, a set of performance indicators including a total volumes of fluids at different well sites in order to examine which areas of a reservoir field are better or worse than average or better or worse than their companions wells at the different well sites,

(d) comparing, in a conformance decision, the map of the performance indicators with a geologic interpretation set forth in the reservoir property and structure maps and determining if any disagreement exists between said map and said geologic interpretation,

(e) if the disagreement does not exist and there is no total conformance, identifying any potential infill well opportunities reflecting any opportunities to drill any infill wells,

(f) if the disagreement does exist and there is total conformance, determining, in a volumetric and material balance fluids in place estimates step, how the well performance trends balance out with estimates of fluids in place and pressure support from material balance calculations, and

(g) in response to the well production decline characteristics generated during the establishing step (b), identifying workover and artificial lift candidates.

36. The method for performing analytical model studies of claim 35, further comprising the steps of:

(h) in response to the well production decline characteristics, identifying from actual well performance, in a statistical analysis of well indicators, an average expected performance,

(i) comparing individual wells to said average expected performance to determine where in the reservoir field there exists superior performing wells and where in said field there exists poorer performing wells, and, responsive thereto, selecting via said potential infill well opportunities step opportunities to either enhance existing wellbores or to drill new wellbores,

(j) in response to the well production decline characteristics and having established the decline characteristics for existing wells, forecasting for that group of existing wells, in current well forecasts of production and reserves, future performance trends of the reservoir field if no action is taken,

(k) in response to the well production decline characteristics and the workover and artificial lift candidates, generating incremental production forecasts,

(l) in response to the well production decline characteristics and the potential infill well opportunities, generating infill forecasts of production and reserves representing a forecast of what an extra well in a particular location might generate,

(m) determining if conformance exists between the incremental production forecasts, the current well forecasts of production and reserves, the infill forecasts of production and reserves, and the volumetric and material balance fluids in place estimates,

(n) if conformance does exist, generating a second output signal for use by a production and reserves forecast, the second output signal including current well forecasts of production and reserves, enhanced well production forecasts, and infill forecasts of production and reserves, and

(o) if conformance does not exist, identifying uncertainties and then generating said second output signal.

37. A method of generating a production and reserves forecast, comprising the steps of:

(a) in response to a plurality of constraints and to a history calibrated model, running a model in a simulator and generating a production forecast representing a way a reservoir responds to a development plan, said development plan defining a mechanism representing a process that is active in a reservoir field,

(b) determining whether an implementation plan of the mechanism or whether the constraints can be changed or optimized,

(c) if the implementation plan or the constraints can be changed or optimized, changing the implementation plan of the mechanism or the constraints, re-running the model in the simulator, and generating another production forecast,

(d) if the implementation plan or the constraints cannot be changed or optimized, determining if the mechanism representing the process that is active in the reservoir field can be changed, and

(e) if the mechanism can be changed which represents a new development plan or new mechanism, revising an implementation plan of the new mechanism to create a new implementation plan and re-running the model in the simulator thereby generating still another production forecast.

38. The method of generating a production and reserves forecast of claim 37, further comprising the steps of:

(f) if the new implementation plan or the constraints cannot be changed or optimized and if the new mechanism cannot be changed, determine if there is any need for parametric sensitivity runs,

(g) if there is a need for parametric sensitivity runs, identify a set of uncertainties, alter a reservoir description in the history calibrated model, and repeat steps (a) to (e),

(h) if there is no need for any parametric sensitivity runs, generating a third output signal which includes reservoir fluids production rates and pressures and total fluids injection rates and pressures and a reservoir development plan;

(i) in response to the plurality of constraints and a current well forecast of production and reserves, an enhanced well production forecast, and an infill forecast of production and reserves, performing, in the analytical production and reserves forecast, analytical modeling and, responsive thereto, generating an analytical forecast for a particular mechanism and a particular set of development constraints, and

(j) repeating steps (b) through (h) until there is no need for any parametric sensitivity runs and generating a fourth output signal which includes reservoir fluids production rates and pressures and total fluids injection rates and pressures and a reservoir development plan.

39. A method of determining a set of facilities requirements in response to a production and reserves forecast, comprising the steps of:

(a) in response to the production and reserves forecast which includes a set of data representing reservoir fluids production rates and pressures, estimating a first set of facilities that are required for the reservoir fluids production rates and pressures,

(b) determining if one or more first set of changes are required to said first set of facilities,

(c) if the one or more first set of changes to the first set of facilities is required, making said first set of changes to said first set of facilities, said one or more first set of changes having associated therewith a capital cost and possible incremental operating cost adapted for use by an economics and risk analysis study,

(d) in response to the production and reserves forecast which includes a set of data representing total fluids injection rates and pressures, estimating a second set of facilities that are required for the total fluids injection rates and pressures,

(e) determining if one or more second set of changes are required to said second set of facilities, and

(f) if the one or more second set of changes to the second set of facilities is required, making said second set of changes to said second set of facilities, said one or more second set of changes having associated therewith a capital cost and possible incremental operating cost adapted for use by an economics and risk analysis study.

40. A method for performing an economics and risk analysis study, comprising the steps of:

(a) in response to a reservoir development plan generated from a production and reserves forecast, evaluating a set of economics which is associated with said reservoir development plan by generating, responsive to the reservoir development plan, a reservoir production schedule and a reservoir injection schedule and a facility and well schedule,

(b) in response to a set of facilities requirements which includes processing and drilling workover plans, generating a capital cost model and an operating cost model associated therewith,

(c) in response to a set of environmental considerations, generating special project costs,

(d) providing, in a plan economic profile, an economic profile and a cash flow summary for the reservoir development plan in response to the reservoir production schedule, the reservoir injection schedule, the facility and well schedule, the capital cost model, the operating cost model, and the special project costs,

(e) determining, in a development and operating risk decision, whether there are significant development and operating risks associated with the reservoir development plan in response to a set of reservoir risk factors,

(f) if there are signficant development and operating risks associated with the reservoir development plan, making adjustments to a set of production forecast schedules and returning to step (d) which provides the plan economic profile and the cash flow summary for the reservoir development plan that produces an estimate of risk associated costs, and

(g) if there are no significant development and operating risks associated with the reservoir development plan, determining if there is a reservoir performance risk relating to a character and a nature of the reservoir that has not been established from history matching and geologic studies.

41. The method for performing an economics and risk analysis study of claim 40, further comprising the steps of:

(h) if there is a reservoir performance risk, making adjustments to a set of production forecast schedules and returning to step (d),

(i) if there is no reservoir performance risk, determining if there is an environmental risk,

(j) if there is an environmental risk, making adjustments to a set of production forecast schedules and returning to step (d),

(k) if there is no environmental risk, determining if there are any alternative development plans which should be evaluated from an economic standpoint,

(l) if there are one or more alternative development plans which should be evaluated from an economic standpoint, repeating steps (a) through (k) for each of the one or more alternative development plans and, responsive thereto, generating one or more corresponding economic profiles associated, respectively, with the one or more alternative development plans,

(m) if there are no more additional alternative development plans which should be evaluated, comparing each of the economic profiles associated with each of the alternative development plans and assessing the risks associated with each of the economic profiles, and

(n) selecting a particular development plan from among the one or more alternative development plans evaluated during step (l), the particular development plan selected during the selecting step (n) representing an optimized development plan.

42. A method of determining a set of environmental considerations adapted for use in connection with an integrated reservoir optimization method, comprising the steps of:

(a) considering special emergency response plans and provisions,

(b) considering pre-construction environmental impact study requirements,

(c) considering interrupted or restricted access to wells and facilities, and

(d) considering government or regulatory approval and audit provisions.